



Diet and Atherosclerosis

Variations on a Theme

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OUR BEST HOPE to arrest, retard or prevent atherosclerosis lies in discovering the reasons for geographic, ethnic, and constitutional variations in the frequency and degree of the disease.

Many countries either lack statistics or have statistics that are not reliable. Results of medical and anatomic surveys from the same area will differ: To the clinician atherosclerosis presents itself in its complications caused chiefly by reduction of a vascular lumen; the pathologist evaluates the underlying anatomic alteration, viewing the whole circulatory system. The limitations of morbidity statistics are obvious. Mortality statistics are worthless unless they are based on necropsy data. But even autopsy protocols will have limited value until all pathologists will describe the blood vessels in detail, using uniform grading of alterations. The International List of Causes of Death and the currently used death certificates hinder rather than further the epidemiologic study of atherosclerosis.

If one wants to learn about the occurrence of atherosclerosis in a distant land he must journey there. Two travelers viewing the same scenery may gain different impressions, and chances are that they will not see the same things. The interests of a nutritionist, cardiologist, and pathologist may overlap, but their reports will be tinted by their specialties.^{1,2}

This pathologist, whose avocation is the

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study of various aspects of atherosclerosis, and his wife, who for decades has been exposed to discussion of atherosclerosis but whose interest lies with markets and kitchens, went to the Far East in search of information about atherosclerosis.

We visited Tokyo, Nikko, Kyoto, Nara, and Osaka in Japan, Bangkok in Thailand, and, on the way, Hong Kong. Many lectures were given and conferences were held at Nihon, Keio, and Tokyo Universities in Tokyo, the Osaka Medical School in Osaka, and Chulalongkorn and Siriraj Medical Schools of Bangkok. Several hospitals were visited in each city including Victoria, Hong Kong. Marketplaces, hospital kitchens, the food of patients, of hospital employes, and of the people in homes and on the street were scrutinized. Japanese, Cantonese, Pekinese, Shanghai, Hong-Kong Chinese, Thai, and "Western" foods were eaten in elegant restaurants, in common and primitive eating places, in hospital dining rooms, and in private homes. Secretaries of Health, nutrition experts, deans of medical schools, teachers at medical schools, hospital directors, clinicians, pathologists, residents, medical students, nurses, and people from various walks of life were questioned extensively.

To discuss Hong Kong with regard to atherosclerosis would be futile. Differences in population (native Chinese, immigrant Chinese, immigrant Hindu, British, others, and mixtures), economic status (from wealth to utter poverty) and way of life (from hut to palatial home) are far too great to allow evaluation of available data. Registration of birth, marriage, or death of humans is not obligatory. Curiously, ducks are either registered (for ex-

port) or not registered ("dead"). "Atherosclerosis is not a problem in Hong Kong. Not even tuberculosis presents a problem. The main concern is with malnutrition, hepatic disorders, parasitic diseases and cancer."³

Japan and Thailand warrant discussion because both countries lie in the Far East but have little in common. Their capitals are more than 2,500 miles apart. Japan lies in the temperate zone; Thailand is in the tropics. Both are monarchies and they may have common political interests. Buddhism is the dominant religion in both countries, but 90 per cent of the Japanese not only are Buddhists but also are devoted to Shintoism.

JAPAN

Diet

Japan has a rather uniform population, in which there are few foreign elements. Diet also is uniform, differences being quantitative rather than qualitative, depending on the economic level. There is little variation between regions or between rural and urban diets. The average daily intake is 2,104 calories, with a minimum of 2,025 and a maximum of 2,176.⁴ Fat provides, on the average, 8.6 per cent of all calories, while proteins contribute 12.8 per cent and carbohydrates 78.8 per cent. The average daily fat consumption is 20 gm., protein 77 gm. and carbohydrates 411 gm.

The fats most used are sesame oil, containing about 87 per cent unsaturated fatty acids; soybean oil, containing on the average 86.6 per cent; and peanut oil, with 82.9 per cent unsaturated fatty acids. The linoleic acid content of the three oils is 21 per cent, 51.2 per cent, and 29 per cent, respectively. The ratio of linoleic acid to saturated fatty acids is 1.6, 3.9, and 1.7, respectively.⁵

Total fat consumption is low, and total protein intake is not very high. Two thirds of the protein come from fish and vegetables, while only one third is obtained from meat. Fish often is eaten raw and many other foods are eaten raw or cooked only slightly. In preparing sukiyaki the cooking utensil is greased lightly. Lean beef is fried, but cooking time is short; it may be dipped into raw egg. Green vegetables, spinach, eggplant, chestnuts, ginkgo

nuts, onions, mushrooms, and plenty of rice are eaten. The rice is unseasoned, boiled, and dry. During a full course dinner, usually served in a restaurant, the Japanese will eat two or three bowls of rice. It is the main source of carbohydrates in his diet. Two or more soups are served with either sukiyaki or tempura. One may be clear, flavored with a slice of lemon, while another may contain 20 or 30 tiny freshwater mussels in shells and be flavored with soy sauce. A third soup may have eight ingredients: mushrooms, seaweed, a green vegetable, chestnuts, tofu (soybean curd cake), morsels of fish, shrimp, and chicken. Sake (rice wine) is served hot in small cups and cooking wine is used to flavor the meat dish, sukiyaki. Tempura differs in the main course which consists of fritters of shrimp or prawn, and also fish. This food is fried lightly in sesame oil. Besides sake, good beer is served and, of course, tea. Every meal begins and ends with tea.

But such meals are eaten by a middle-class family only once or twice a year on a special occasion. Otherwise, one meal consists of a bowl of rice and another of cold boiled rice wrapped in seaweed, and dried fish and soup. The younger generation, office girls, and some housewives in Western clothes will sometimes eat a light luncheon of a fruit-salad sandwich or sherbet in a downtown tearoom. The evening meal, again, will be traditionally Japanese.

At times Americanization has progressed to absurdity: In a night club in Kyoto we saw a teenage geisha girl in traditional garb "jitterbugging." However, eating habits have been influenced only slightly. Milk and egg consumption is negligible. The middle-class Japanese does not consume over half a pound of meat per month. At night, young people stop at open stalls, off the streets, to buy fish or meat broiled quickly over charcoal. During the day many will eat excellent French-type pastry with their tea, but no desserts are served after meals. A few grapes and two or three slices of papaya or persimmons are served instead of dessert. Green-leaf-tea sherbet is now fashionable in better restaurants.

Life in a Japanese inn, a "ryokan," was fascinating. Each meal consisted of several dishes. Breakfast started with tea, then a



small dish of cold stringbeans with peanut butter was followed by a plate containing two tiny cold fish, a piece of parsnip, a pickle or ginger, and two cubes of sweetened colored soybean cakes. Next came a bowl of soup with mussels, a bowl of rice, another soup with tofu and a piece or two of chicken, more rice, and more tea. Plenty of tea was served. Luncheons and dinners followed this general pattern. The quantity of each meal was large; the total nutritive value was low; the meals were not filling.

Cardiovascular Diseases

On the diet described the Japanese are lean. Some of the more corpulent men have spent a year or two in the United States. The average Japanese is not undernourished, but he is somewhat less than "well nourished." His height is less than that of the American and so is his weight.

Cardiovascular diseases occurred in 14.5 per cent of all hospital patients in 1954. Today, the figure will be higher. Since 1936, the incidence of angina pectoris, myocardial infarction, and renal and cerebrovascular diseases has been steadily rising. The ascending curves were slightly disturbed by a drop in frequency during the war years of 1942-1945 and into the following year. Since 1949, the increase has been steady and marked. Curves for anginal symptoms, whether spontaneous or elicited by effort, and for myocardial infarction run parallel.

The incidence of cerebral hemorrhage is twice that encountered in North America; it is more frequent than myocardial infarction. Hypertension, as such, also is more common in Japan than in the United States. In contrast to atherosclerosis, which has a uniform distribution throughout Japan, hypertension is more common in the North than in other parts of the country. Clinical data⁶ are matched by anatomic data.⁷ Both types were collected by members of a special Committee of the Ministry of Education. Cooperative studies from various districts deal not only with atherosclerosis of coronary arteries but also with that of the aorta, of the basilar and renal arteries, and myocardial infarction.

The death rate from heart disease was 60.4 per cent in 1955. The ratio of males to females was about the same as in America as far as myocardial infarction and atherosclerosis are concerned. In several institutions, especially in Osaka, vascular lesions are being rated according to acceptable criteria, and Japanese observations match those of American investigators. Positive correlation of the degree of atherosclerosis between coronary arteries and aorta is close to 80 per cent. Coronary disease appears earlier or at the same time as aortic disease. Basilar and renal artery disease develops later and more slowly than that of coronary arteries. By and large, the blood vessels of Japanese are comparable with those of Americans.^{8,9} The discrepancy between the clinical⁶ and anatomic⁷ data is apparent in reports from Kyoto: According to clinical data the incidence of anginal pain and myocardial infarction is much higher than elsewhere (this is explained by selection of patients), while the necropsy incidence of coronary sclerosis and of myocardial infarction is much lower than in other areas of Japan.

Interest in hypertension and atherosclerosis is high. It manifests itself in numerous publications dealing with anatomic, clinical, and experimental aspects of these diseases. Intensive research is carried on everywhere, and lectures were followed by eager questions. The questions and papers presented by the Japanese revealed good knowledge of bibliography. Many symposia were arranged to provoke the guest's discussion remarks. Efforts are being made to organize a study group along the lines of the American Society for the Study of Arteriosclerosis.

THAILAND

Diet

Thailand presents a different picture from that of Japan. There is a substantial Chinese population in Bangkok, and Chinese are infiltrating the northern provinces. In the South, there are some Moslems besides the Thai. Dietary habits are not uniform and differ in quality as well as in quantity. Rice eaten in the North is sticky and glutinous, and contains 1-2 per cent protein, while the rice eaten in Bangkok



is polished. In the North, the main source of carbohydrates is rice, but in Bangkok about 10 per cent of carbohydrates originates from sources other than rice. Along the coast fish consumption is higher and meat consumption lower than in the rest of the country.

Thai statistics are confusing. According to data considered valid until 1957,¹⁰ in Bangkok the average daily intake per capita was 2,000 calories, with fat contributing 13 per cent, protein 12 per cent, and carbohydrates 75 per cent of the total calories. The same report showed average daily consumption of fat was 28 gm.; of protein, 60 gm.; and of carbohydrates, 420 gm. In one rural area, daily intake was 1,746 calories with 6.7 per cent from fat, and in another 2637 with 5 per cent from fat.

Statistics for 1958 record the average daily per capita intake for Bangkok as 1,209 calories, with fat providing 27 per cent, protein 13 per cent, and carbohydrates 60 per cent of the total. The average daily ingestion of fat is given as 42 gm.; that of protein, 47 gm.; and that of carbohydrates, 208 gm. (which would add to 1486 calories). Differences in these two statistics are understood as one learns that the second survey does not include Chinese (which does not imply that the first survey did) and that "in Bangkok, only 75 families among the random sampling of 225 Thai families were cooperative."¹¹ In the Sansai district of Chiangmai Province in the North, 80 families were studied. There the total intake was 1951 calories, with 11 per cent contributed by fat (22 gm. daily), 10 per cent by protein (45 gm.), and 79 per cent by carbohydrates (340 gm.).

In a table supplementing these data the per capita intake of carbohydrate providing food is 491 gm., comprised of 487 gm. of raw rice, 3 gm. of other starchy food, and 1 gm. of sugar.¹¹ The same table shows a daily consumption of 49 gm. of green leaf vegetables and 20 gm. of fresh fruit for Chiangmai, while the accompanying text cites multiple vitamin deficiencies.¹¹ It was explained to us that the survey had been made in summer when vegetables and fruits were plentiful and actually replaced some other foods. In Huarea, one of ten villages of Muang district in Ubol Province in the North, 32 families were studied. Their average intake

was 1,722 calories, with but 3 per cent contributed by fat (5.5 gm. daily), 11 per cent by protein (46 gm.), and 86 per cent by carbohydrates (344 gm.). The table indicates 510 gm. of raw rice as the sole source of carbohydrates. Correlation of diet with health has not been possible to date because of refusal of physical examination by the populace. The work of the nutritionist is trying, indeed.

Moslems and Chinese have not yet been studied. The Moslems in Bangkok are tall and lanky but appear well nourished. The Chinese of Bangkok are prosperous and eat better and more than the Thai. They weigh more than the Thai but, of course, they are differently built, having heavier and longer bones. The girls in a brothel seemed well nourished; the men in an opium den were emaciated. The Thai are small, slender, muscular, and well nourished. Some of the men are stocky; few are obese. Eating habits belie the statistics. Walking the streets one has the impression that Thai and Chinese cook and eat all day long. The Thai kitchen is strongly influenced by Chinese and Western cooking, and few restaurants in Bangkok list Thai dishes. The main dish is rice but there is a piece of meat in every bowl, be it that of a hospital nurse or that of the riksha boy, and the food is hot from the use of spices. Bangkok food is greasy; everything is fried in deep fat. On the streets, meats, bananas, and doughnuts are fried in lard.

Lard is the main source of fat (43 per cent saturated fatty acids). Some coconut oil is used, with about 91.2 per cent saturated fatty acids⁵ (the lowest figure for saturated fatty acids in coconut oil is 82 per cent). The linoleic acid content of lard is 10 per cent, that of coconut oil but 2 per cent; the ratio of linoleic acid to saturated fatty acid is 0.23 for lard to 0.02 for coconut oil.

Cardiovascular Diseases

While there are no statistics concerning the incidence of atherosclerosis, the rarity of clinical disease is pointed out by all physicians in Thailand. Clinicians can count on their fingers the number of patients with myocardial infarction or angina pectoris. Myocardial



infarction is a rare postmortem diagnosis. The aortae appear "younger" at necropsy than those of Americans of corresponding age. Complicated atherosclerotic lesions are seen in the aged only. Since older people shy away from hospitals, the hospital population is younger in Thailand than in the United States. Our repeated question as to the longevity in Thailand remained unanswered. The honest reply to this and many other relevant questions was monotonously the same: "Don't know."

The low incidence of atherosclerosis is even more surprising when one learns that diabetes mellitus is common. Physicians encounter the renal complications of diabetes but not those in other sites. We could not ascertain whether diabetics develop hypercholesteremia, nor did we hear about blood cholesterol of nondiabetics. Hypertension is common, occurring in 6 to 7 per cent of hospital patients in 1954-1955. Necropsy findings seem to support clinical observations.

Atherosclerosis does not constitute a problem in Thailand, for the present at least. No published data are available. Because of the paucity of clinical and anatomic material, interest in the subject is limited. Lectures were well attended and questions were asked, but only those who had had an opportunity to observe the magnitude of the problem in the United States showed genuine interest in the topic. There is no research in this field in Thailand, since lack of physicians and inability of the two medical schools to provide sufficient physicians make it imperative to concentrate on medical care and teaching.

COMMENT

Japan and Thailand represent two extremes. According to our prevailing concept the Japanese diet can be labeled "antiatherogenic." Subject to future correction based on acceptable statistics, the diet in Thailand can be labeled "atherogenic," in spite of the total caloric intake, which is lower than in the United States. The Japanese diet is low in calories, fat, and cholesterol. Food is heated little or not at all. Fried food is rare. The fat used is rich in linoleic acid and other unsaturated fatty acids. The diet in Thailand, in Bangkok at

least, is rich in fat and cholesterol. Fried food is common, and all food is greasy. The fat used contains little linoleic acid and few other unsaturated fatty acids. The Japanese eat dry rice and green-leaf-tea sherbet; the Thai eat greasy rice and meat and coconut ice cream. The physical appearance of the people reflects the diet. The composition of the diet can influence that of the blood.¹²⁻¹⁴ The parallelism, if it exists at all, goes no further; atherosclerosis is common in Japan and rare in Thailand.

Evidence to support the concept that high levels of plasma cholesterol, per se, in main are atherogenic is far from conclusive. Circumstantial evidence, however, indicates that the kind, or amount, of dietary fat is in some way related to some stage of atherosclerosis in man. A reduction in intake of the more saturated fats in the diet may ultimately prove desirable for health but is not yet mandated by currently available evidence.

This latest, frequently quoted, cautious statement by the Food and Nutrition Board of the National Research Council⁵ may have to undergo revision.

As a sentimental afterthought of an all but sentimental journey, one may wish to be allowed to borrow from the three-faced Buddha and thus be able to see more, hear more, and ask more questions. And one may wish to imitate the Buddha with eight arms and thus be able to hold more than one scale to weigh all the information and impressions in the hope of arriving at valid conclusions.

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